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Nonconventional hydrocarbon targets in the crystalline basement, and the problem of the recent replenishment of hydrocarbon reserves

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Abstract

Analysis of the distribution of oil pools in sedimentary cover has shown that known platform hydrocarbon fields are closely associated with faults in the crystalline basement and the sedimentary cover itself. Oil pools in the lower productive beds of the sedimentary cover are linked to faulted zones in the crystalline basement. A genetic relationship between oil fields and tectonic dislocations indicates a dominant role for vertical migration in the accumulation of commercial hydrocarbons in the Paleozoic. The conducted geochemical, palynological, geophysical and geological studies have shown that oil and gas pools in the upper sedimentary cover have been formed due to the vertical migration of hydrocarbons, which is also confirmed by the vertical alignment of the oil pools.

Keywords: Crystalline basement; Oil fields; Faulted zones; Vertical migration

1. Introduction

Degassing is a major process in the Earth's development. According to an existing hypothesis, the Earth's interior degassing and production of a wide range of volatiles (e.g. hydrogen, helium, carbon dioxide, sulphur, mercury) includes hydrocarbons, and enables the accumulation of oil and gas deposits in shallow crustal reservoirs. A number of commercial oil pools in crystalline basement rocks have been noted in more than 300 oil and gas deposits on different continents. In some, oil and gas are present at a depth of several hundred meters from the surface, e.g. Russia and Ukraine. For example, such pools have been found in a number of areas on the northern flank of the Dnieper–Donets Basin (Chebanenko et al., 1995). Little attention has been paid to this hypothesis; however, the potential for the presence of deep fluids that promote the formation of commercial oil pools is a new factor that must be seriously treated with regard to oil and gas exploration, development and production.

However, many questions remain unanswered at this point. Is the process of degassing related in some way to the recent (continuous or periodic) formation and reformation of oil and gas fields? What is the scale and intensity of such degassing, if any? How can this process be quantitatively evaluated? And finally, how

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